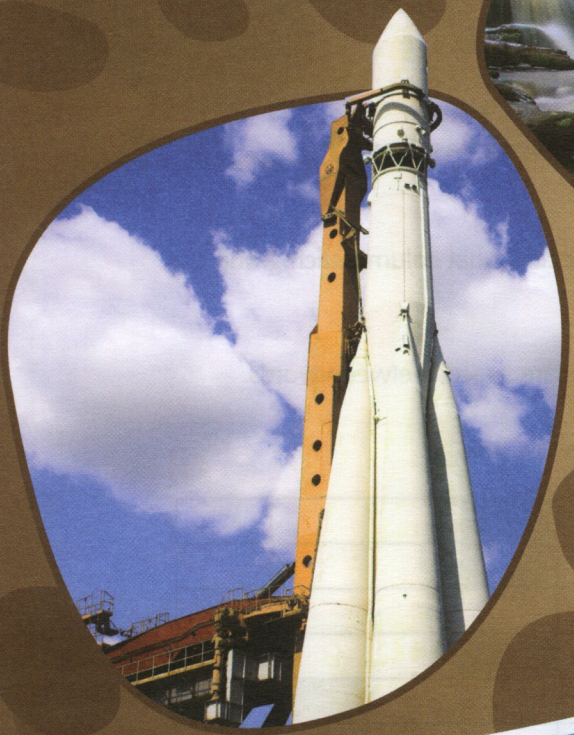
DIG IT!

The Secrets of Soil



advanced

YOU ARE SOIL! NO I'M NOT! YES I AM!

You don't think you are soil? Guess again! We are soil! Almost all of the minerals and nutrients we need for life, to nurture us, to help us grow, to give us energy and keep us healthy come from fields, gardens, trees and pastures. Every plant, vegetable, or fruit that we eat gets its nutrients from the soil in which it grows. We are soil! Every animal gets its nutrients from the plants it eats, which get their nutrients from the soil they grow in...so animals and the ecosystems they live in are soil! Only a small part of the Earth's soil can be used for growing food, and we are already farming most of it. To avoid the threat of world-wide hunger in the future we must keep our soils healthy. So remember, don't treat your soil like dirt!

FDR Speaks Out on Soil

1882-1945
Franklin Delano Roosevelt

Former President Franklin Roosevelt felt very strongly about soils. Solve this puzzle to find out what he had to say.

FILL IN THE BOX BY:

1. Put each group of letters in a column of squares going downward from top to bottom. Keep the letters in the group in the same order they are given. The first column has been done for you.
2. The groups of letters are not given in the correct order. You will have to decide what column each group should go into.
3. No letters go in the squares that are blacked out. The blacked out squares are spaces between words.
4. When you are finished write the quote you have found on the lines below the box.

NTSILOE	ENDSOTT
TITOE	TARSDSF
AHTTYL	EIRS
HOYSSI	

T			■			
I			■			
T	■					
O			■			
■					■	
E						
■						

_____

_____

-Franklin Delano Roosevelt
Thirty-second President of the United States
1933-1945

WHAT DOES IT HAVE TO DO WITH ME?

Ways I Depend on Soils

1. _____
2. _____
3. _____
4. _____

Can you think of three ways you depend on soils every day?

Think about where you live. If you live in a house or an apartment building, what is it built on? **SOIL.**

Is your house or apartment building made of brick? Where does brick come from? Clay in the **SOIL.**

What have you had to eat today? What was it grown in or raised on? **SOIL.**

Are you wearing blue jeans or a tee shirt made of cotton today? That cotton was grown in the **SOIL!**

Did you drink any water today? Water is cleaned and filtered through **SOIL.**

Have you walked in the woods lately? Where do ecosystems like forests and wetlands get their water and nutrients? **SOIL!**

"Dirt's a lot more fun when you add water!"

-Hank Ketcham, Dennis the Menace (2004)

CLORPT Secret Code Puzzle

Place the answers to the clues into the blanks to the right of each clue. Next, put each letter into the box in the puzzle using the number and letter under each blank. When the puzzle is finished you will be able to read a message.

	A	B	C	D	E	F	G	H	I	J
1										
2										
3										

1. A soil's parents are the _____ rocks and minerals that it came from.

2. _____ can speed up or slow down weathering.

3. A lot of these live in the soil. You might call them bugs.

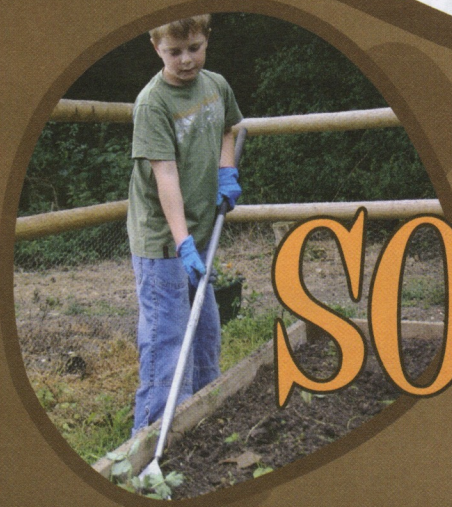
4. Breaking _____ rocks and minerals takes a long time.

5. Relief is what direction the land _____.

6. Any organism that lives in it _____ the soil.

	R							
A3		F3	C1	E1				G3
			P					
H1				D2			F1			J1
				C				
B1		D3				H2	I2	
			N					
A1	E3							
	A							
B3		E2		C2				
W								
	G2			I1		F2		

CLORPT is a mnemonic (a special word used to help a person remember something) for Hans Jenny's famous state equation for soil formation.



SOIL = A mixture of minerals, air, water, dead and rotting remains of plants and animals (organic matter) and LOTS of living organisms! Soil is alive …it has parents, it gets old, it breathes!

SECRET CODE NAME:

CLORPT

CLORPT is an equation for soil formation. By solving the equation, you will discover what hidden things in your neighborhood make soils. It all begins when rocks are broken down into very small pieces over a period of a few hundred years or sediments are carried in and deposited by wind, water, glaciers, or even gravity. Add some air, water, minerals, living and non-living organic matter, and you have soil!

CLimate

Soil is formed when rocks and minerals are weathered and broken down. Temperature and the amount of rain that falls can either speed up or slow down chemical reactions. Warmer temperatures usually speed reactions up, cooler temperatures slow them down. For example; let's start with a piece of limestone, throw it in a nice warm spot with lots of rain, wait a few years and let some weathering occur. Next grow some corn, which you eat on the cob at a county fair and end up providing your body with calcium from the limestone! DIG IT!

1. Plant roots produce carbon dioxide and release it into the soil.
2. When it rains, there is a chemical reaction between the carbon dioxide in the soil and the rain water, forming carbonic acid.
3. Limestone has a mineral called calcite in it. The carbonic acid dissolves the calcite into calcium.
4. The calcium is absorbed by the roots of the corn as it grows.
5. You eat the corn. DIG IT!

Organism

Animals that dig burrows, plant roots, worms, insects and microorganisms all physically and chemically weather soil.

Relief

Relief is the slope of the land or how steep the hill is. Relief is also what direction the land faces. The relief of the land influences how many hours of sunlight the soil gets, its temperature, how much water runs off of it and how many plants live in it.

Parent Material

Yes its true, soil has parents. A soil's parents are the original rocks or sediments that it came from. The rocks could have been huge boulders that were right there all the time, or smaller rocks or sediments of sand, silt and clay that were carried in by wind or water.

Time

Breaking down rocks and minerals takes a looooooong time! But it does happen. If you give it plenty of time, "weathering" will turn solid rock into soil.

There are more organisms in one shovel full of soil than all of the people living on planet Earth.

ME...SOILS...YOU...SOILS WE ALL DIG SOILS!

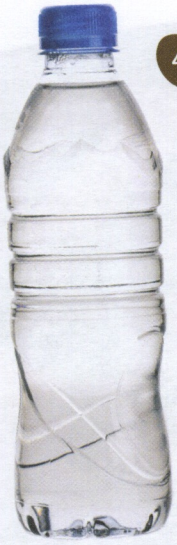
Below are pictures of some ways you might use soils without even knowing it. Draw a line to connect the picture on the left to the description on the right that tells how soils are used by YOU!

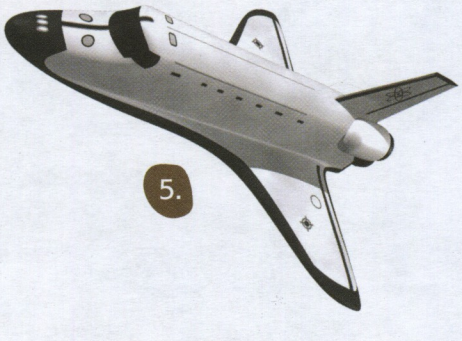
1.

2.

3.

4.





5.

6.

A. The tiles that protect this from intense heat are made from sand that comes from soil.

B. This is made from cotton fiber that comes from a plant grown in soil.

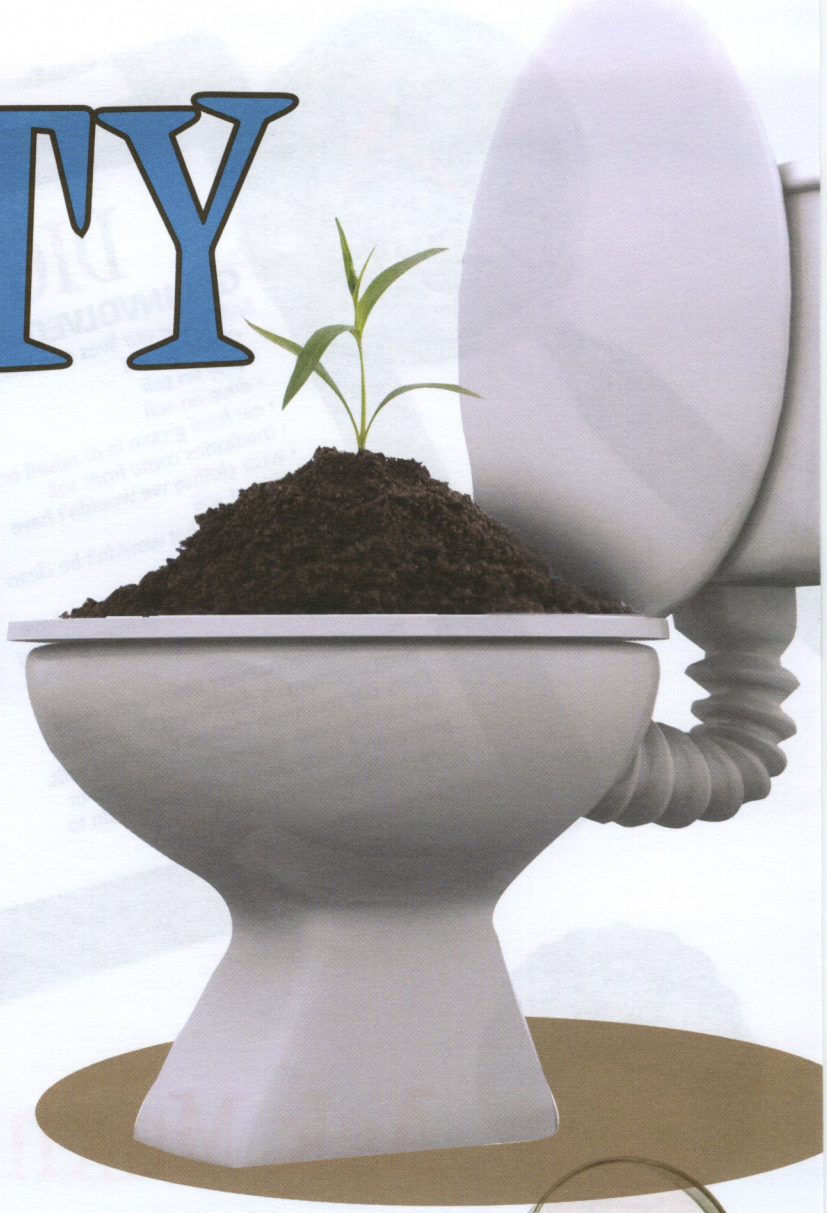
C. Soils control the movement of this, they make it available to plants, they filter and clean it before it reaches streams, lakes, and you.

D. These can make you feel better or even save your life and many of them come from microorganisms that live in the soils.

E. This is made from clay which is a part of soil.

F. Soils grow this before it ends up in a box on a store shelf, and a cow ate crops grown in soil to produce milk so you could enjoy it!

POTTY SOIL



A toilet is definitely something you use every day. Now, what does it have to do with soils? Take a close look at your "potty" and then check out these facts:

Potty Soil Fact #1

Most of the toilet is made of ceramic. Ceramic is made from clay which comes from the soils.

Potty Soil Fact #2

The toilet seat is made from wood. Wood comes from trees grown in the soils.

Potty Soil Fact #3

The toilet tank and bowl are filled with water. Water is filtered and cleaned by soils before we use it.

DIG DEEPER

AFTER THE FLUSH

What happens to the water in the toilet bowl after it is flushed? What does it have to do with SOIL? You might consider SOIL as the largest water filter in the United States. At least one out of every four people in the U.S. has a septic system which uses soil to filter wastewater. Become a junior soil scientist, do some investigating, find out why soil and soil type is important when you flush! Ask your family or county health department what type of septic system you have and how it interacts with soil. Check with local developers or go online and research alternative ways to deal with wastewater in your location. Remember the type of soil where septic systems are located is important. You will find out how to locate your soil type in the Ask Maxine section.

DIG DEEPER

GET INVOLVED

Soils make our lives possible. We:

- build on soil
- play on soil
- drive on soil
- eat food grown in or raised on soil
- medicines come from soil
- wear clothes we wouldn't have without soil
- drink water that wouldn't be clean without soil
- breathe clean air we wouldn't have without the plants and trees growing in soil

The entire Earth...every ecosystem...every living organism...is dependent upon soils. Every day you make choices that affect soils. Take a close look at your own back yard or playground. Write down what you will do to protect or improve your soils.

Ask Maxine

Q: Does it matter what kind of soil you build a house on?

A: Yes! There are many different soils. You need to be sure that you build a home, office, school or even paths in a park on the right soil. You can find out what type of soil and which soil is best for your project by visiting a USDA-NRCS or your local conservation district office. You can also visit the USDA website at http://soils.usda.gov/ where you can find soil surveys which tell you about the different soils in each state.

Maxine is a 47-year employee of NACD.

*These **DIG IT!** education materials were developed by NACD based on an exhibition developed by the Smithsonian's National Museum of Natural History and sponsored by the Soil Science Society of America and the Nutrients for Life Foundation.*

National Association of Conservation Districts (NACD) http://nacdnet.org

Soil Science Society of America http://soils.org

Smithsonian Institution http://forces.si.edu/soils

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Correlations to national standards, educators guide and answer key at http://nacdnet.org/education

Booklet designed for use with grades 4-5.

Answer to CLORPT secret code puzzle:
"Dig It The Secrets of Soil"

Answer to FDR Speaks Out:
"The Nation that destroys its soil destroys itself"
- Franklin Delano Roosevelt

Answers to "We All Dig Soils": 1D, 2B, 3F, 4C, 5A, 6E